



FAG



Energy Savings by Means of New Machined Needle Roller Bearings

Increased performance density and reduced friction

Energy savings by means of new machined needle roller bearings

Features Higher performance needle roller bearings with the suffix D or reduced friction needle roller bearings with the suffix TW open up new possibilities in the development or revision of machinery and subassemblies.

X-life The needle roller bearings are X-life bearings and have raceways with an optimised surface. This gives higher load carrying capacity and longer rating life.

Needle roller bearings with increased performance density

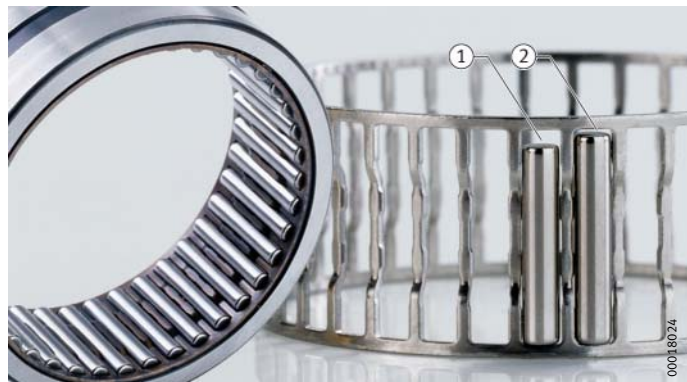
Needle roller bearings with the suffix D have a newly developed steel cage that is profiled and has been produced using improved forming technology. The cage is designed such that the bearing can accommodate a larger number of needle rollers of greater length while the bearing dimensions remain unchanged, *Figure 1*.

Due to the larger number of rolling elements and the increase in their load-bearing length, the basic load ratings are increased by up to 25%. As a result, the bearings can support significantly higher loads within the same design envelope.

These needle roller bearings open up possibilities for designing machines and subassemblies that require less space but have the same performance level.

- ① Length of needle roller in a needle roller bearing of standard design
- ② Longer needle rollers in newly developed needle roller and cage assembly

Figure 1
Needle roller bearing with improved needle roller and cage assembly



Advantages

The needle roller bearings of improved design offer several advantages:

- The improved performance density of the bearings allows smaller components and subassemblies
- better utilisation of the design envelope
- reduced frictional torque due to an improved bearing position
- high load carrying capacity
- lower mass.

Example of reduction in design envelope

The X-life needle roller bearing NK20/16-D-XL with an enveloping circle diameter of 20 mm and a width of 16 mm has a load carrying capacity higher than that of the X-life needle roller bearing NK26/16-XL with an enveloping circle diameter of 26 mm, *Figure 5*, page 5. If the bearing is used in order to achieve smaller machinery and subassemblies, the load carrying capacity remains the same while the section height of the bearing is reduced by 15%, the mass by 20% and the friction by 30%.

Needle roller bearings with TWin Cage

Needle roller bearings with TWin Cage comprise a plastic cage with two adjacent needle rollers per pocket and a machined outer ring, *Figure 2*.



Figure 2
Needle roller bearings with TWin Cage

Advantages

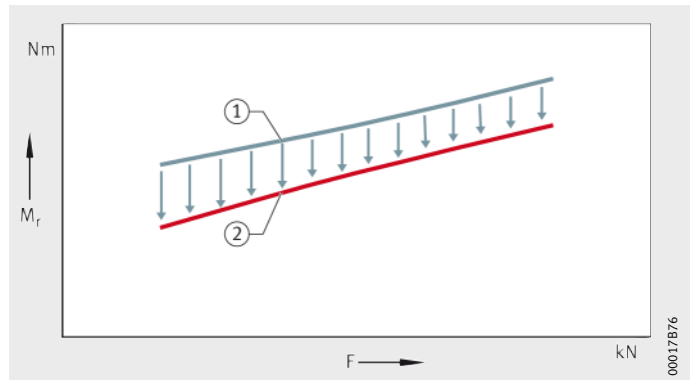
In comparison with conventional needle roller bearings with one long needle roller per cage pocket, the friction is reduced by up to 25%, *Figure 3* and section Example of reduction in friction by means of TWin Cage.

The reduction in friction leads to:

- reduced heat generation
- longer grease operating life and longer lubrication intervals
- higher accuracy due to smaller temperature differences.

- M_r = frictional torque
 F = bearing load
- ① Standard bearing with one needle roller per pocket (suffix TV)
② TWin Cage

Figure 3
Lower friction in needle roller bearings with TWin Cage



Example of reduction in friction by means of TWin Cage

In a comparison between the X-life needle roller bearing NK45/20-TV-XL with a plastic cage and the new TWin Cage, the difference in frictional power at $4\,000\text{ min}^{-1}$ is between 25 W and 30 W. The lower generation of heat in the bearing gives a longer grease operating life and thus longer lubrication intervals. Due to the smaller temperature differences, the accuracy of the application is increased. Since the load is distributed over both rows of needle rollers, the kinematic characteristics of the bearing are improved. Series of tests have shown that the bearings have a significantly longer operating life under the same load.

Energy savings by means of new machined needle roller bearings

Operating temperature Open bearings can be used at operating temperatures from $-20\text{ }^{\circ}\text{C}$ to $+120\text{ }^{\circ}\text{C}$.

Suffixes Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
D	Bearing with improved steel cage for downsizing option	Standard
TW	Bearing with cage made from glass fibre reinforced polyamide 66 and two short needle rollers per cage pocket	

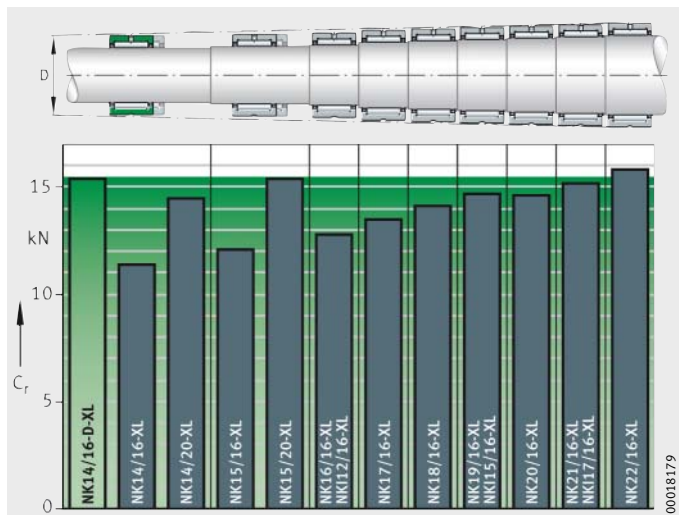
Design and safety guidelines Design and safety guidelines: see Catalogue HR 1, Rolling Bearings. If inner rings are to be used in bearings with a higher performance density and the suffix D, please consult the engineering service of the Schaeffler Group.

Comparison of basic load ratings

Needle roller bearings with a higher performance density and the suffix D cover a wide range of enveloping circle diameters of the standard bearings from 14 mm to 70 mm, *Figure 4 to Figure 8*.

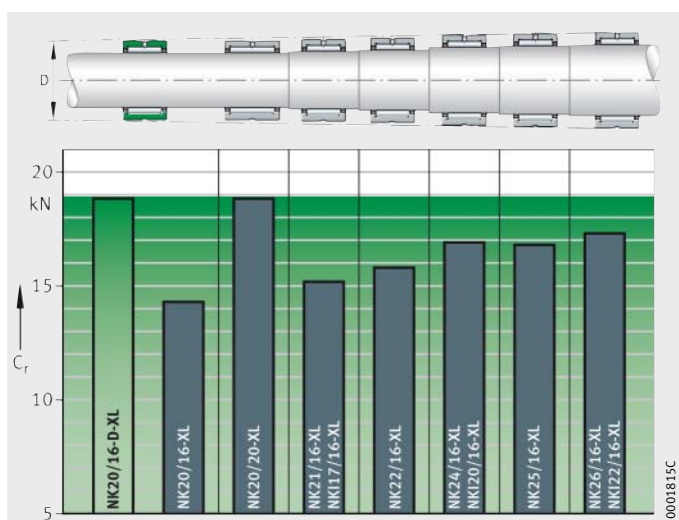
NK14/16-D-XL
 C_r = basic dynamic radial load rating
 D = bearing outside diameter

Figure 4
 Basic load ratings for enveloping circle diameter 14 mm to 22 mm



NK20/16-D-XL
 C_r = basic dynamic radial load rating
 D = bearing outside diameter

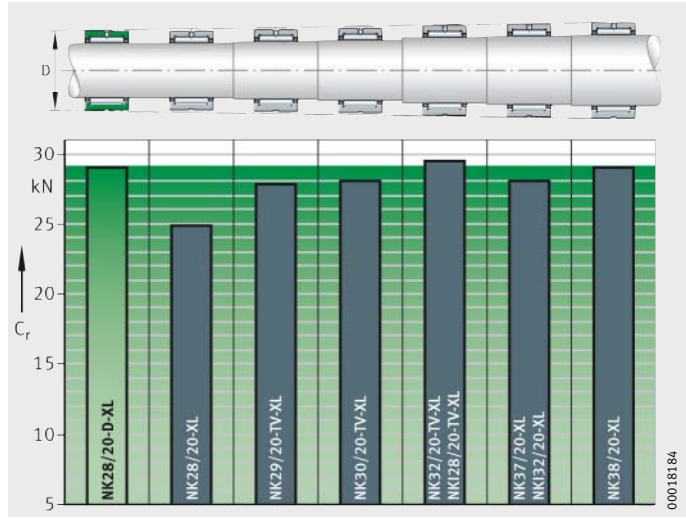
Figure 5
 Basic load ratings for enveloping circle diameter 20 mm to 26 mm



Energy savings by means of new machined needle roller bearings

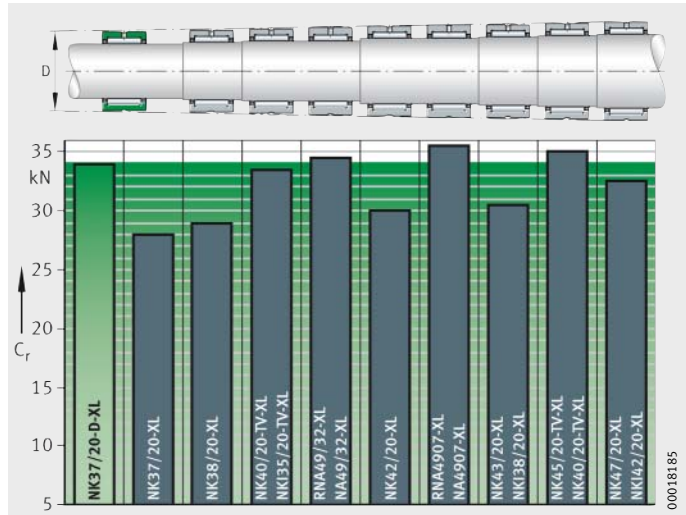
NK28/20-D-XL
 C_r = basic dynamic radial load rating
 D = bearing outside diameter

Figure 6
 Basic load ratings
 for enveloping circle diameter
 28 mm to 38 mm



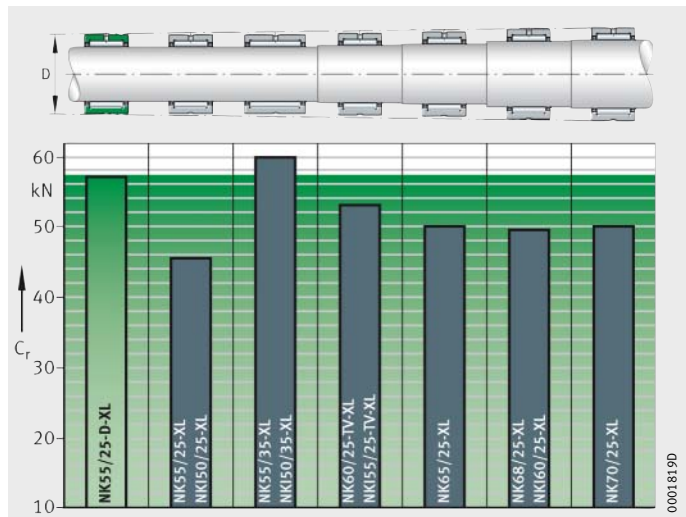
NK37/20-D-XL
 C_r = basic dynamic radial load rating
 D = bearing outside diameter

Figure 7
 Basic load ratings
 for enveloping circle diameter
 37 mm to 47 mm



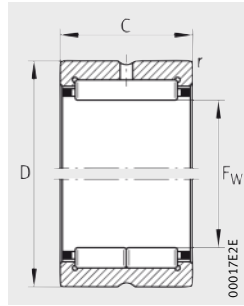
NK55/25-D-XL
 C_r = basic dynamic radial load rating
 D = bearing outside diameter

Figure 8
 Basic load ratings
 for enveloping circle diameter
 55 mm to 70 mm

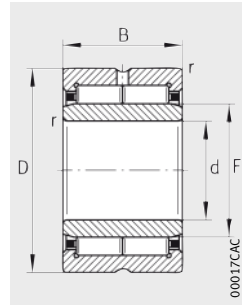


Needle roller bearings

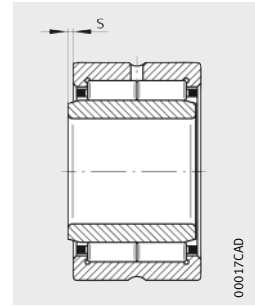
Without inner ring
With inner ring
Open



NK..-D, NK..-TW



NKI..-TW



Axial displacement

Dimension table - Dimensions in mm

Designation	Mass m ≈ g	Dimensions						Basic load ratings		Fatigue limit load C _{ur} N	Limiting speed n _G min ⁻¹	Reference speed n _B min ⁻¹
		d	F _w	D	C	r min.	s	dyn. C _r N	stat. C _{0r} N			
NK14/16-D-XL	21,4	–	14	22	16	0,3	–	15 400	17 100	2 850	24 600	14 600
NK20/16-D-XL	28,4	–	20	28	16	0,3	–	18 500	23 900	4 050	21 100	10 900
NK28/20-D-XL	58	–	28	37	20	0,3	–	29 000	41 500	7 400	15 800	8 100
NK37/20-D-XL	83	–	37	47	20	0,3	–	34 000	56 000	9 900	12 300	6 300
NK55/25-D-XL	195	–	55	68	25	0,6	–	57 000	111 000	19 400	8 400	4 350
NK30/20-TW-XL	61	–	30	40	20	0,3	–	28 000	39 000	7 300	14 800	7 800
NKI35/20-TW-XL	122	35	40	50	20	0,3	0,5	33 500	53 000	9 900	11 400	6 300
NKI40/30-TW-XL	216	40	45	55	30	0,3	1	52 000	102 000	18 200	10 200	5 500
NKI55/25-TW-XL	255	55	60	72	25	0,6	1,5	53 000	98 000	17 000	7 700	4 450

Further sizes of needle roller bearings with suffix TW available by agreement.

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